Hua Hong Semiconductor 华虹半导体 (1347 HK)

Leading specialty foundry in power discrete and eNVM

Hua Hong Semiconductor is a specialty, pure-play foundry that is uniquely focused on processes which include eNVM, power discrete, analog & power management and logic & RF. It reported 3Q19 revenue of USD239mn (-0.9% YoY/+3.9% QoQ), meeting guidance. GPM of 31% was inline. We expect the company to deliver stronger topline growth with expanding capacity which serves fast growing areas like discrete, MCUs, and RF, propelled by 5G/IoT adoption tailwinds. We estimate FY19E/FY20E EPS to be US¢12.2/US¢14.2 and net margin to compress 3.0ppt due to the new fab but will stabilize. We initiate at BUY with a TP of HK$19.0.

- **3Q19 revenue up 3.9% QoQ, helped by strong MCU/analog.** Demand for MCUs/analog products were robust, especially in China where revenue grew 8% YoY. Super junction/IGBT demand were also highlights. But, smart cards continued to be soft along with general MOSFET which dragged down U.S revenue by 12% YoY. GPM was 31%, inline with prior guidance.
- **4Q19 guidance a bit light on revenue but GPM dilution was expected.** 4Q revenue was guided to be US$242mn (implies 2.8% YoY decline) with US$5mn-US$6mn contribution from Wuxi. GPM expected to be 26%-28% which should not be surprising as depreciation from Wuxi fab sets in.
- **Power discrete continues to be a key growth area.** Discrete revenue contributed to 39.1% of total revenue in 1H19, growing 24% YoY, and was the only major segment to record positive YoY revenue growth (+10.9%) in 3Q19. Super junction/IGBT were strong but offset by general MOSFET weakness. We believe HV applications are expanding, e.g. EVs, industries, which is supported by 24.2% YoY increase in industrial/automotive end market revenue in 3Q19.
- **5G is an important catalyst for the wafer industry.** Management believes that wide adoption of 5G can drive smartphone/IoT device purchases and improve semiconductor IC demand.
- **Initiate with BUY.** We believe Huahong has a good track record of improving net margins coupled with a fast growing topline. Despite a softer wafer industry, we believe the market is optimistic for discrete/MCUs which are what Huahong is strong in. We arrive at our TP of HK$19.0, implying 16x FY2020E PE and 1.3x FY20E P/B ratio.

Investment Summary

FY-end Dec	2017	2018	2019E	2020E	2021E
Turnover (US$mn)	**808**	**930**	**941**	**1,080**	**1,258**
Chg (%)	*12*	*15*	*1*	*15*	*17*
Net Profit (US$mn)	**145**	**183**	**157**	**183**	**221**
Chg (%)	*13*	*28*	*(14)*	*16*	*21*
EPS (USD)	**0.14**	**0.17**	**0.12**	**0.14**	**0.17**
Chg (%)	*13*	*22*	*(28)*	*16*	*21*
P/E (x)	12.0	9.9	13.8	11.9	9.8
P/B (x)	1.0	0.7	0.8	0.7	0.7
P/OCF (x)	6.8	6.6	9.0	8.0	6.6
EV/EBITDA (x)	5.8	4.7	5.6	4.8	4.0
DPS (USD)	0.04	0.04	0.04	0.04	0.04
Yield (%)	2.4	2.4	2.4	2.4	2.4

Source: Company data, Orient Securities (Hong Kong)

BUY

Share Price	Target Price
HK$13.16	HK$19.00

China / Technology / Semiconductor

18 November 2019

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Latest Key Data

Total shares outstanding (mn)	1,299
Market capitalization (HK$mn)	16,933
Enterprise value (HK$mn)	12,373
12M daily average turnover (HK$mn)	100
12M volatility (%)	51
PEG FY19-21E (X)	0.8
RoE avg FY17-19E (%)	9.5
P/B FY19E (x)	0.8
Net debt/equity FY19E (%)	Net Cash

Performance (%)

	1M	YTD	12M
Absolute	(15)	(9)	(17)
Relative to HSI	(13)	(11)	(18)

Major Shareholders (%)

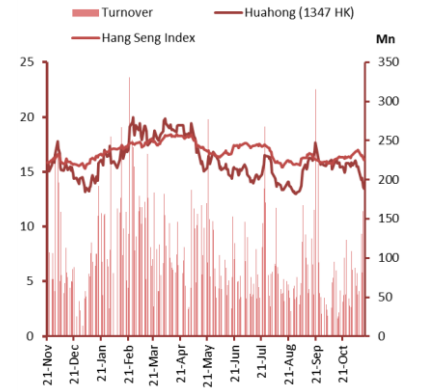
Shanghai Hua Hong International, Inc.	27
Xinxin HK Capital Co Ltd	19

Auditor

Ernst & Young

Price Chart

Price (HK$) *Turnover (HK$mn)*



Source: Bloomberg, Orient Securities (Hong Kong)

A global, leading foundry focused on specialty chips

Huahong Semiconductor is a global, leading pure-play 200mm foundry that focuses on manufacturing semiconductors on 200mm wafers for specialty applications. Its manufacturing expertise is accrued through years of R&D of advanced and differentiated technologies for 200mm wafer manufacturing, and is a powerhouse in eNVM and power discrete. Other advanced process technologies include RFCMOS, analog and mixed signal, CMOS image sensors, PMIC and MEMS. Its products are incorporated into a broad range of end markets, including consumer electronics, communications, computing and industrial and automotive.

Recently, to continue to meet customers' and future market demand for IoT, 5G and other advanced control applications, Huahong has entered a JV to build and operate a new 300mm foundry in Wuxi. Risk production has already begun in 4Q19E with monthly capacity targeted to average 10K wafers and to reach 20K by FY20E. We believe capacity expansion and technology upgrade can allow Huahong to further boost its topline and then net income as profitability improves over time.

Managed by a team of seasoned industry experts

Mr. Suxin Zhang, Executive Director and chairman, has extensive experience in hi-tech strategic development, energy strategy research and the power equipment industry. He graduated from Tsinghua University with a bachelor's degree in engineering, and is a professor-level senior engineer.

Mr. Yu Wang, an Executive Director and president since 2012, helped setup the first 200mm wafer semiconductor production line in Mainland China as VP and CFO of HHNEC. Later, he was instrumental in the successful consummation of the merger and restructuring of HHNEC and Grace Shanghai. Mr. Wang holds a bachelor's degree in international trade and a master's degree in international finance from Shanghai University of Finance and Economics.

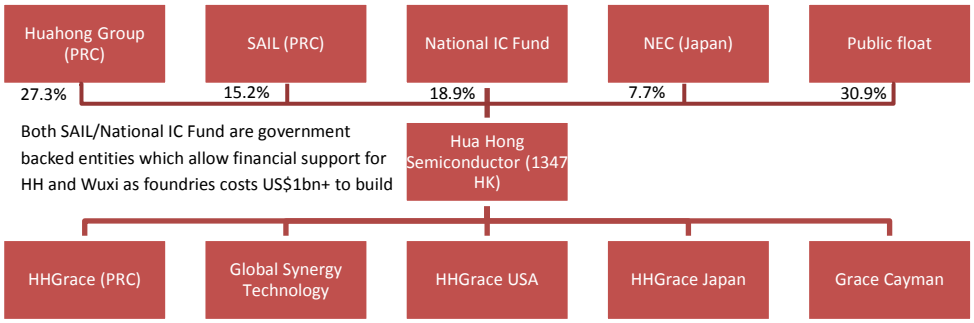
Mr. Daniel Yu-Cheng Wang, an executive vice president, joined Grace Shanghai in 2001 and played a key role in Grace Shanghai's development and in the successful IPO of the company. Prior to that, he was employed by Franklin Templeton Investments (U.S.) and LSI Logic Corporation in Silicon Valley. He obtained a bachelor's of science degree in industrial engineering and operations research from the College of Engineering, University of California, Berkeley, and a master's of business administration in finance and banking from the University of San Francisco.

Figure 1. Company key milestones

- **2018:** Launched **12"** project in Wuxi.
- **2016:** Begun production of **90nm eFlash** process platform.
- **2015:** Begun production of **0.11µm ultra-low-leakage eFlash** and also expanded total capacity to 146k wafers/month.
- **2014:** Sucessfully listed on SEHK and 90nm e-NVM technology platform ready for design in.
- **2012:** Annual shipments by Grace Shanghai and HHNEC of **0.13µm ICs** for SIM cards reached ~1.8bn units.
- **2011:** Begun 600V SJNFET & 1200V NPT IGBT production and accumulative shipment of power MOSFET exceeded 2mn wafers.
- **2005: 0.15µm PC chipset** began production
- **2004: 0.25µm eFlash** automotive engine control unit began production
- **2003: 0.20µm PC chipset, 0.25µm / 0.18µm standalone NOR flash** begun production. DRAM phased out, foundry services began.
- **2000:** Grace Shanghai was established.
- **1999: DRAM** production line pilot run.
- **1997:** Shanghai Hua Hong NEC Electronics (HHNEC) was established.

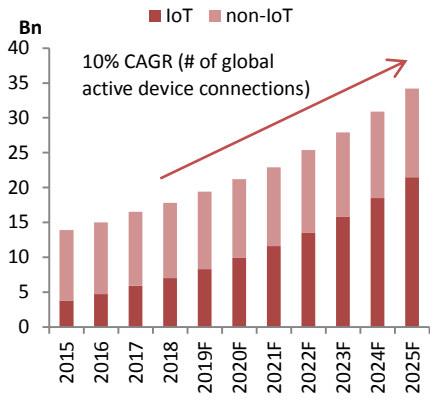
Source: Company, Orient Securities (Hong Kong)

Figure 2. Company structure



Source: Company, Orient Securities (Hong Kong)

Figure 3: IoT devices growth



Source: IoT Analytics 2018, Orient Securities (Hong Kong)

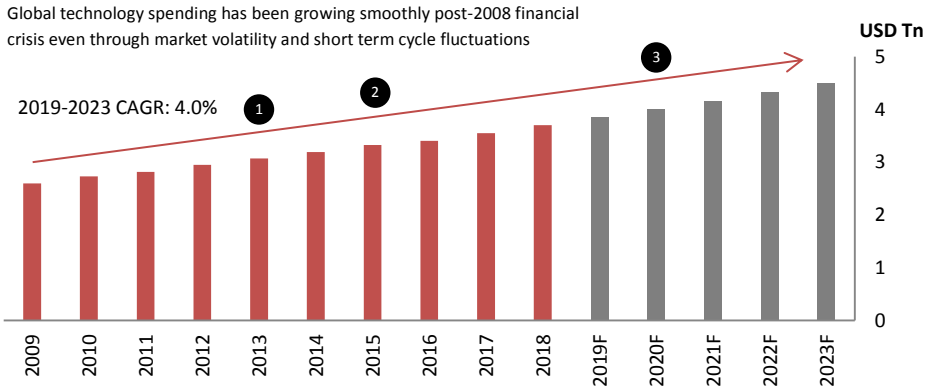
Global technology spending on the rise

Global technology spending is forecast to continue to grow above world GDP, catapulted by new technologies, e.g. IoT, robotics, AR/VR, in the next few years even as traditional tech spending on hardware, software, services and telecom grows on par with GDP.

Emerging markets are moving swiftly to focus on rapid adoption of new technologies with high ROI for selected industrial use cases such as deployment of IoT and robotics solutions by manufacturing firms in China and the rest of Asia. Governments in these markets are also eager to drive investment in new technologies, leading aggressive smart city initiatives and integrating ICT with economic planning. China's tech spending has grown at double the pace of the world for the past decade and we believe it will continue to lead.

5G upgrade will provide an additional catalyst for the adoption of IoT devices as connection reliability improves while more computing power and new sensors will help improve cost effectiveness. The natural cohesion between the traditional and new technologies will spur synchronized growth, for instance, increasing share of traditional server/storage spend to support IoT as a back-end and larger investment in cloud, mobile, social and analytics to deploy robotics with AI and improve AR/VR for end-users.

Figure 4. Global technology spending



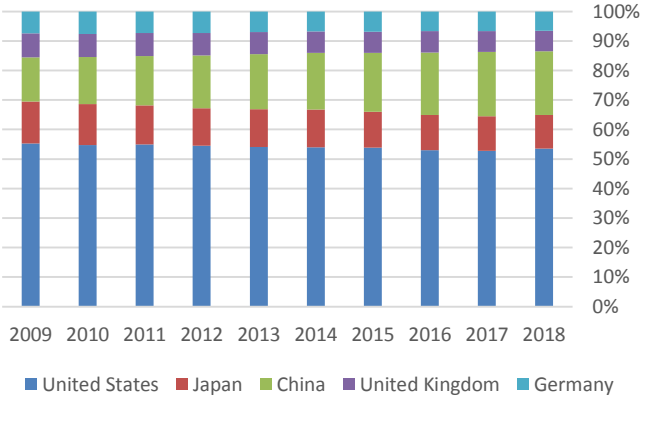
1. 4G becomes mainstream in most developed cities and is 10x faster than 3G

2. iPhone 6 series ushers in new upgrade cycle, especially with adoption of larger screens, and multi-model releases in a single iteration.

3. 5G mainstream deployment in various locations (expected). 5G theoretically could hit 10Gbps which is much faster than 4G LTE's 150Mbps

Source: Bloomberg, Orient Securities (HK)

Figure 5: Global technology spending by region



Source: Bloomberg, Orient Securities (Hong Kong)

China's technology spending is growing at more than double the pace of world spending while most of the technology consumed in China is not produced there. Thus, there is a driver to locate production in China to be closer to customers.

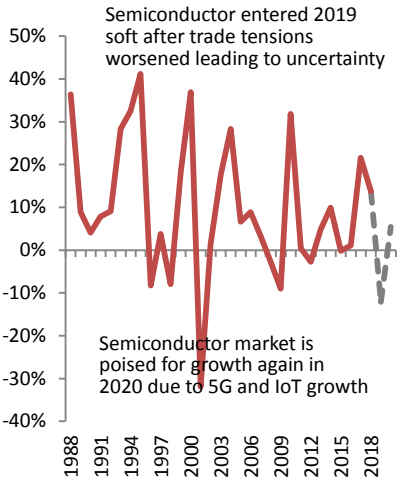
Figure 6: Spending CAGR by region

2009-2018 CAGR	
Global	4.0%
China	**8.4%**
United States	3.8%
United Kingdom	2.6%
Germany	2.6%
Japan	1.6%
By region	
North America	3.9%
Western Europe	1.6%
Asia/Pacific	6.5%
Latin America	6.7%
Middle East & Africa	5.1%
Central & Eastern Europe	4.2%

Source: Bloomberg, Orient Securities (Hong Kong)

Semiconductor industry is cyclical but provides long-term growth

Figure 7: Global semiconductor market



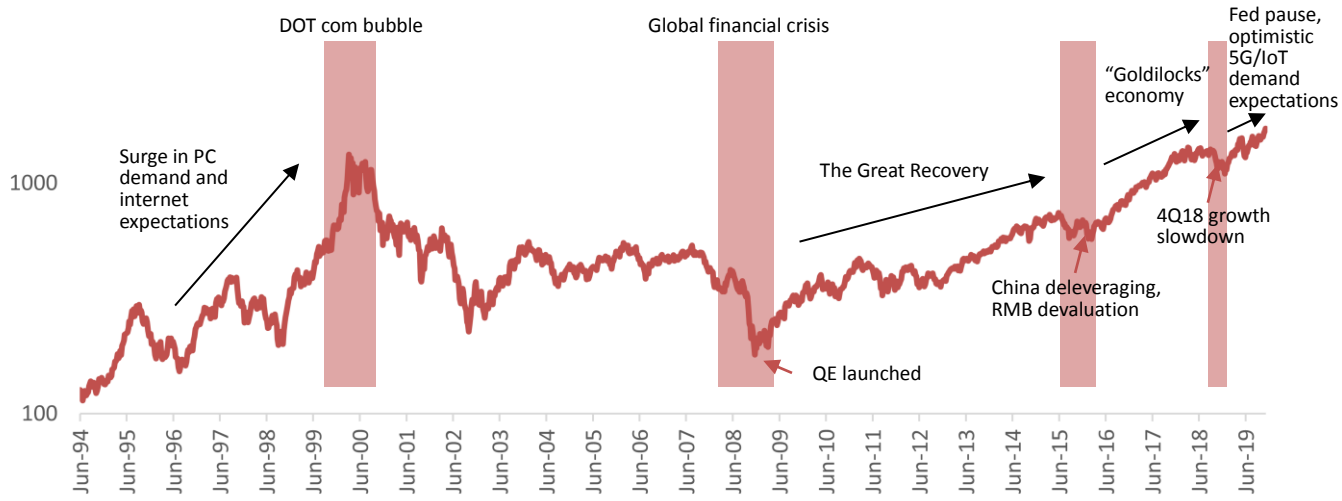
Source: World Semiconductor Trade Statistics (WSTS), Statistica, Orient Securities (Hong Kong)

The global semiconductor market is forecast to grow above world GDP in the next five years, as market opportunities are teeming in communication, consumer electronics, automotive, and industrial industries. The major drivers behind the semiconductor market are growth in wireless communication and IoT devices, and increasing demand for advanced safety features in automotive, artificial intelligence and machine learning. After a soft 2H18 rolling over to 1H19, as chip supply overwhelmed cautious demand, the market is optimistic regarding new growth areas (5G/IoT), and flash storage prices have begun to stabilize as inventory gets worked down.

China's share of global IC consumption is rapidly growing while domestic production is catching up to meet demand

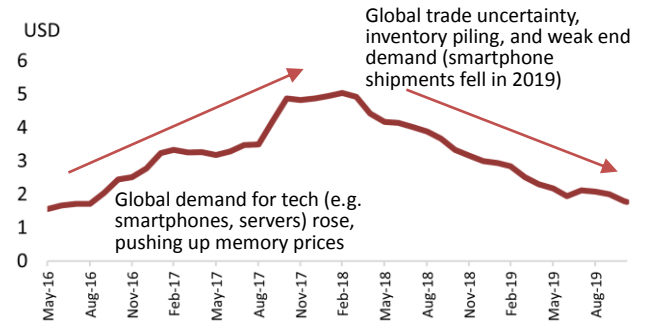
We believe China will continue to be the largest consumer of semiconductor IC in the world, primarily due to its high volume electronics manufacturing and mass consumer market. About US$240bn worth of semiconductors were shipped to China in 2018, representing 48.6% of worldwide semiconductor value. The IC design market in China is expanding rapidly, reaching US$33bn in 2018, up 26.9% YoY, and is expected to grow at a CAGR of 20% during 2018-22F. Benefiting from this, global foundry revenue grew 4.55% in 2018 and is projected to increase at a CAGR of 4.62% during 2018-22F. (Source: IHS Markit)

Figure 8. Philadelphia semiconductor index (log scale)



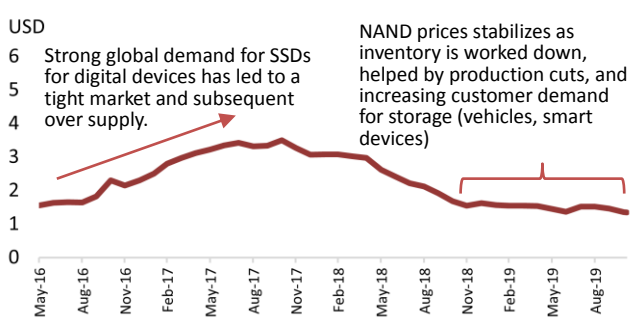
Source: Bloomberg, Orient Securities (Hong Kong)

Figure 9: DRAM pricing



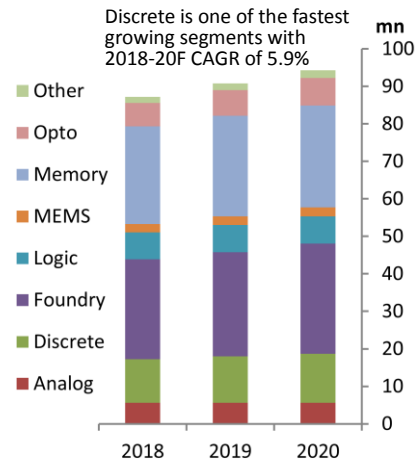
Source: inSpectrum Tech Inc DRAM Spot Price DDR4 4Gb 512Mx8 2133/2400 MHz, Bloomberg, Orient Securities (Hong Kong)

Figure 10: NAND pricing



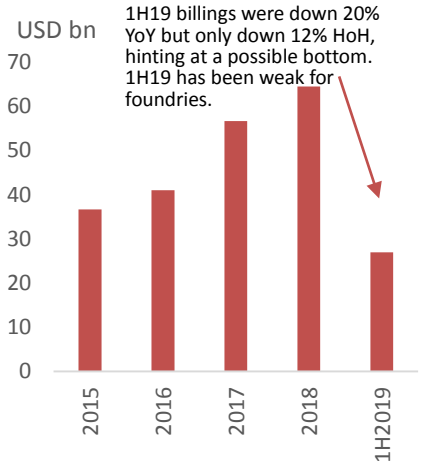
Source: inSpectrum Tech Inc NAND FLASH Spot Price TLC Flash 64Gb 9182Mbx8, Bloomberg, Orient Securities (Hong Kong)

Figure 11: Global capacity by segment



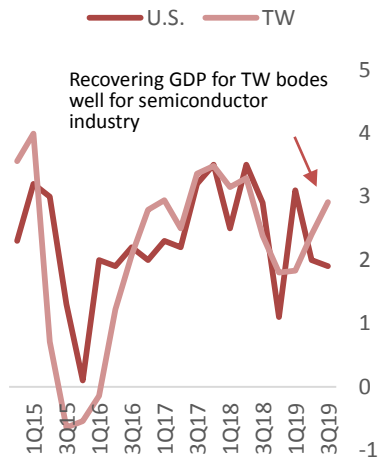
Source: Bloomberg, Orient Securities (Hong Kong)

Figure 12: Global Equipment Manufacturer Billings



Source: Bloomberg, Orient Securities (Hong Kong)

Figure 13: U.S./TW GDP YoY growth rate



Source: Bloomberg, Orient Securities (Hong Kong)

Competitive advantages of 200mm over 300mm

There is a growing market opportunity for 200mm foundries mainly because for certain applications, compared to 300mm foundries, 200mm foundries are 1) more cost effective, 2) can cater to highly variable products requiring specialty processes and 3) more stable wafer ASPs and longer lifespan.

Cost advantages in depreciated equipment and capacity expansion

Despite 300mm wafer manufacturing offering performance advantages over 200mm wafers such as higher processing speeds, more energy efficient and more dies per wafer, operating costs of a 300mm foundry cost are prohibitively high, which may run at US$5bn-US$10bn per year for R&D expenses and to compete effectively in those markets. Given that 200mm wafer technology is already mature, pre-owned and refurbished equipment lower the cost of capacity expansion (US$50mn-$US100mn per year of expansion) and improve GPM as the equipment may have already been depreciated to a great extent. Equipment can have their life extended by 10-15 years if maintained well.

Cheaper photomask and design costs

About 60% of the costs come from labor (>20%), wafer substrate and depreciation. Manufacturing using 200mm has lower costs associated with photo masks and design services and reduced material costs as it requires less process layers compared with 300mm.

Specialty processes allow for above industry average margins for 200mm foundries

There is a continuing need to manufacture at higher nodes offered by 200mm due to access to specialty wafer processes required and is more economical to produce on 200mm wafers where production volume is limited as products are varied. Unique wafer processes allow the foundry to enjoy above-market revenue growth in areas where wafer price premiums appear, such as non-volatile memory, which includes smart card ICs and MCUs.

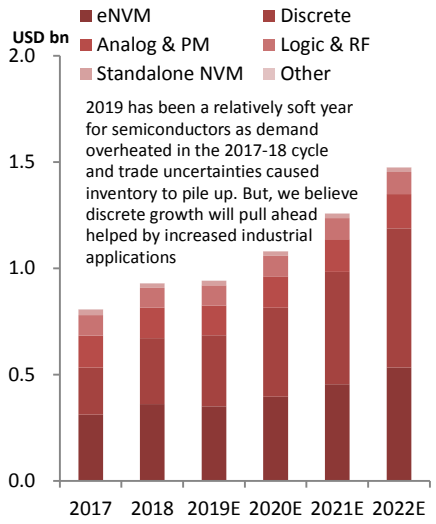
Specialty processes enable, for instance, greater analog content at smaller die size or support of the higher voltages required in automotive and other industrial segments.

There is barrier to entry as foundries need to invest time, capital and R&D resources to manufacture wafers using these specialty process technologies at commercially viable yield levels because of the need for very tight tolerances over the process parameters.

More stable wafer ASPs and longer lifespan

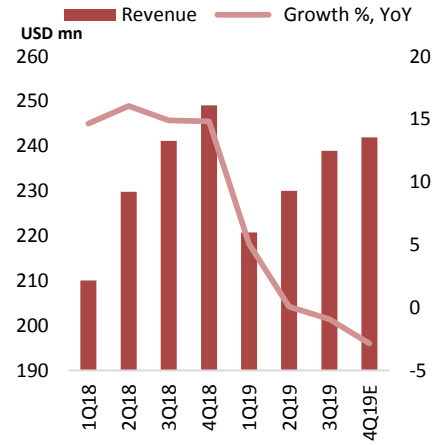
The specialty 200mm wafer market is characterized by lower volatility in ASPs and revenue, and typically enjoys a longer product lifetime because the markets that are being addressed are stable. This allows 200mm wafer manufacturing equipment to outlast 300mm counterparts which have higher levels of depreciation. This translates to a leaner cost structure for 200mm foundries.

Figure 14. Revenue breakdown



Source: Company, Orient Securities (Hong Kong)

Figure 15. Quarterly revenue



Source: Company, Orient Securities (Hong Kong)

Specialty focus drives industry leading profitability

Total revenue 9.7% CAGR during 2013-18 helped by strong discrete/eNVM

Huahong Semi grew its revenue to US$930mn in FY18, representing a 2013-18 CAGR of 9.7%, higher than the industry's 8.5%. This was helped by advanced, differentiating technologies in power discrete and eNVM which grew at 2013-18 CAGR of 20% and 12%, respectively. Through its one-stop shop services ranging from design service and mask manufacturing to packaging and testing, Huahong has successfully built up its global reputation as a leading, specialty foundry in delivering globally competitive and differentiated process platforms with a good track record in manufacturing automotive chips in volume.

Power discrete to continue to lead growth with higher GPM

We believe discrete growth will continue to power ahead as industrial applications increase in EVs, transport, smart grid and home appliances. Notably, as world leading foundry for discrete, its discrete technologies were well recognized with MOSFETs employed in automotive body stabilization systems and IGBTs utilized in inverters for electric vehicles, including new-generation technologies, such as super-junction (SJ) MOSFET Generation III, RC-IGBT and SJ-IGBT, which will facilitate revenue growth 2019+. We project discrete to contribute to 39% of total revenue in FY20E (1H19: 39.1%) and carry 40%+ GPM.

eNVM to improve as MCU/embedded flash demand recovers

Its core segment, eNVM, contributed to 36.4% of total revenue in 1H19, down from 39.2% in 1H18, as sales fell 4.6% YoY, mainly because of weakness in financial cards. GPM in eNVM is estimated to be 20-25% with bank/SIM cards being on the lower end while ID cards/MCUs being better. Looking forward, we believe future smart control applications will drive demand for MCUs and with the HH's expansion in eNVM capabilities, the number of new products using 0.11μm embedded flash technology rose. In 1H19, wafer shipment volume and ASP of embedded flash technology for MCU recovered YoY.

Wuxi 300mm fab to commence risk production in 4Q19

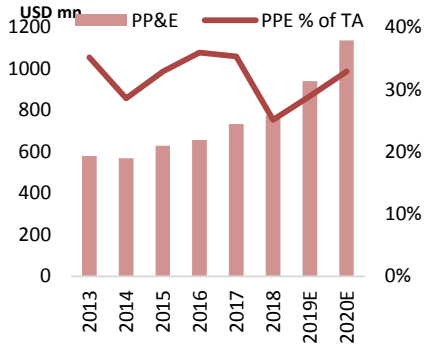
With the help of Wuxi, phase one will bring a targeted 40K wafers/month, starting with 55nm logic/RF CMOS in risk production in 4Q19, followed by 300mm discrete. We believe, in the next 5 years, HH can grow with an average annual revenue growth of 20-25% due to capacity and technology upgrades.

Figure 16: Key growth assumptions

USD mn	2018	2019	2020	2021	2018-21 CAGR
Revenue	**930**	**941**	**1,080**	**1,258**	**10.6%**
eNVM	361	351	396	455	8.0%
Discrete	310	335	419	528	19.4%
Analog & PM	142	139	146	154	2.6%
Logic & RF	95	95	96	99	1.7%
Standalone NVM	21	21	21	21	-
Other	0.5	0.5	0.5	0.5	-
YoY	15.1%	1.2%	14.7%	16.5%	-
eNVM	15.8%	-3%	13%	15%	-
Discrete	41%	8%	25%	26%	-
Analog & PM	-6%	-2%	5%	5%	-
Logic & RF	-1%	-	2%	3%	-
Standalone NVM	-20%	-	-	-	-
Other	-75%	-	-	-	-
Blended GPM	33.2%	29.2%	30.4%	32.3%	-

Source: Company, Bloomberg, Orient Securities (Hong Kong)

Figure 17: PP&E additions



Source: Company, Orient Securities (Hong Kong)

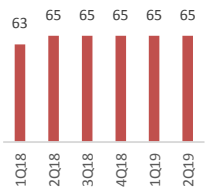
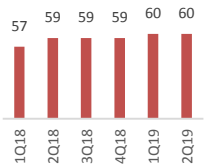
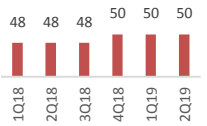
Leading 200mm pure-play foundry with differentiated technology

Huahong Semiconductor is the second largest 200mm (8") pure-play foundry by revenue globally, with expertise in nodes from 1µm to 95nm, delivering differentiated, customized discrete, eNVM, Analog & PM, logic and RF process platforms, while having been a major player in volume manufacturing of automotive ICs.

A significant portion of the assets lie within its three 200mm fabs in Shanghai with a combined monthly capacity of 175K wafers, cleaning room area of ~41,500m^2, and factory area of around ~420,000m^2. The 300mm (12") fab in Wuxi is a JV established by HHGrace, China Integrated Circuit Industry Investment Fund Co., Ltd., and Wuxi Xi Hong Lian Xi Investment Co., Ltd. The planned capacity of phase one is 40K wafers/month will cost $2.5bn in capex ($1.8bn in equity/$0.7bn in bank loan), and will focus on emerging growth areas, such as IoT and 5G. We expect Wuxi fab to begin risk production of 55nm logic/RF CMOS as soon as 4Q19E and 300mm power discrete to come in FY20E.

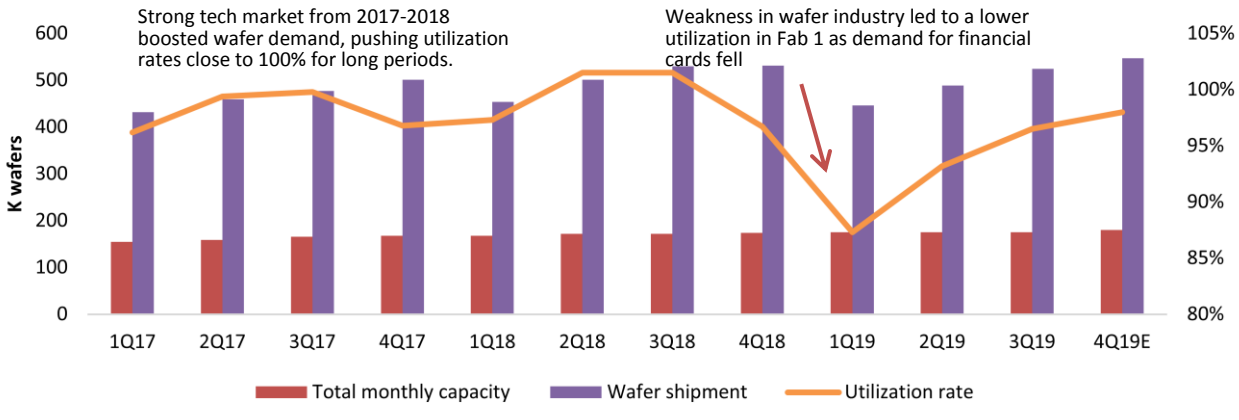
Figure 18: Fabrication facilities




	Fab 1 (Shanghai)	Fab 2 (Shanghai)	Fab 3 (Shanghai)	Fab 7 (Wuxi)
Wafer size	200mm	200mm	200mm	300mm
Node	95nm	0.18µm	90nm	65/55nm
Capacity increment trend ('000s wafer/month)				Expected to be in risk production as early as 4Q19 for 55nm logic and RF CMOS
Est. monthly capacity ('000s wafer/month)	65	60	50	10 (FY20E avg.) 40 (target)
Utilization rate	80-90%	100%	100%	-
Product focus	Older smart cards, MCUs	Power discrete	MCUs (touch)	MCUs, smart cards, power discrete

Source: Company, Orient Securities (Hong Kong)

Figure 19: Capacity, wafer shipment and utilization rate



Source: Company, Orient Securities (Hong Kong)

Power discrete growing at breakneck pace

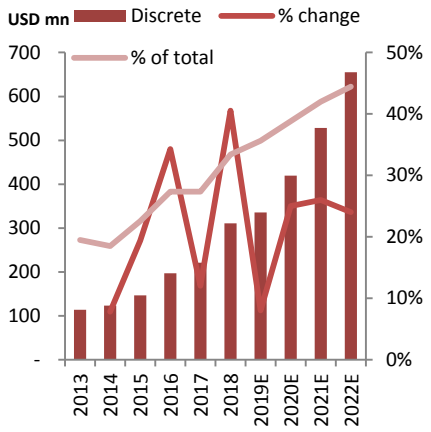
Discrete is the fastest growth area for Huahong with revenue growing 24% YoY in 1H19, contributing to 39.1% of total revenue, up from 32.3% in 1H18. We believe power discrete is Huahong's strongest business line as it has established a strong track record for mass production of advanced MOSFET products which ensures high yield, quality and reliability. HH has built up many successful business cases for customers with its customized technology transfer and new development, helping them shorten time-to-market for new products.

Discrete is seeing increased usage in high-voltage applications, particularly for electric vehicles and other industrial uses, e.g. smart grid, transportation, and energy. GPM and ASPs for HV discrete, such as DT-SJNFET and IGBT, are higher and increasing capacity ratios help improve product mix and blended GPM.

HH-Wuxi will bring about 300mm power discrete technology which will enlarge production capacity and introduce newer technology that will expand its industry-leading advantages in the discrete field, especially for medium/high voltages, and attract more domestic and overseas customers.

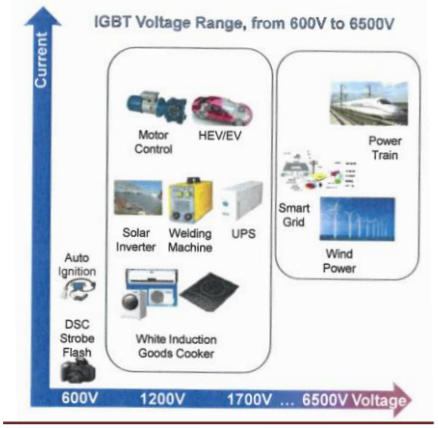
We estimate discrete revenue mix is about >20% for lower voltages (0-60V), mid-teens for EVs, and ~5% for extreme voltages.

Figure 20: Power discrete growth



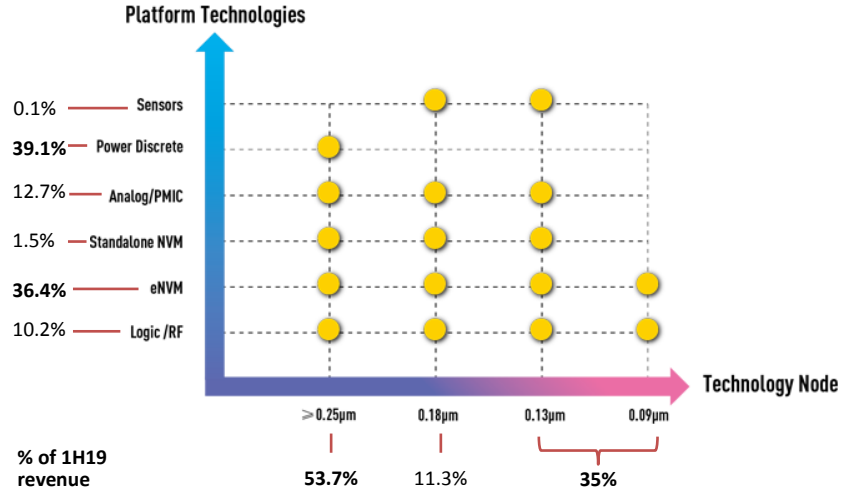
Source: Company, Orient Securities (Hong Kong)

Figure 21: IGBT voltage range and applications



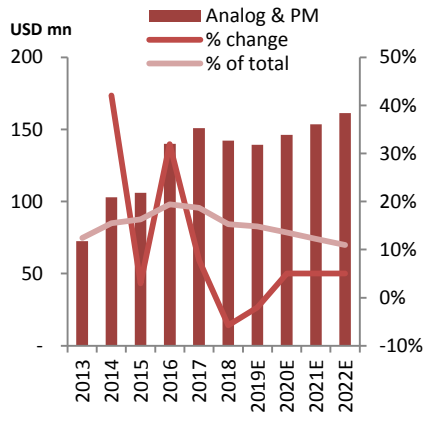
Source: Company, Orient Securities (Hong Kong)

Figure 22. Revenue breakdown by platform and node



Source: Company, Orient Securities (Hong Kong)

Figure 23: Analog & PM growth



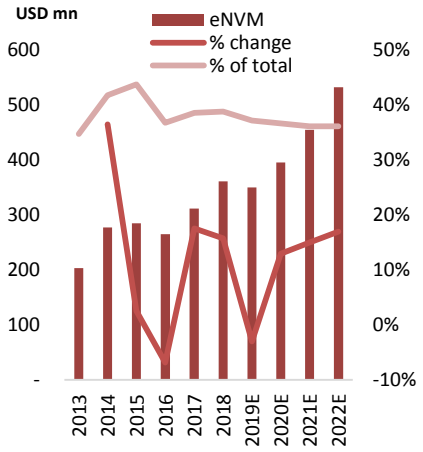
Source: Company, Orient Securities (Hong Kong)

Power management segment stable with 90nm BCD in early stages of R&D

HH offers an advanced process platform for power management IC including BCD (Bipolar, CMOS and DMOS) and CDMOS process. These ICs are found in products such as audio amplifiers, indoor and outdoor lighting (including LEDs), power management (DC-DC/AC-DC converters), industrial control and automotive electronics.

90nm BCD is in early stages of R&D and is expected to provide superior cost competitiveness compared to the 0.18μm BCD platform, especially in power management IC Platform for 5G smartphones.

Figure 24. eNVM growth



Source: Company, Orient Securities (Hong Kong)

Figure 25. eNVM sales by quarter

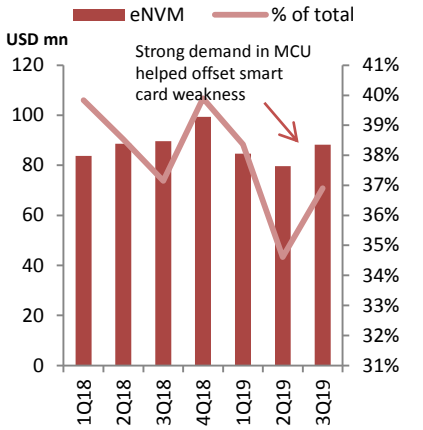
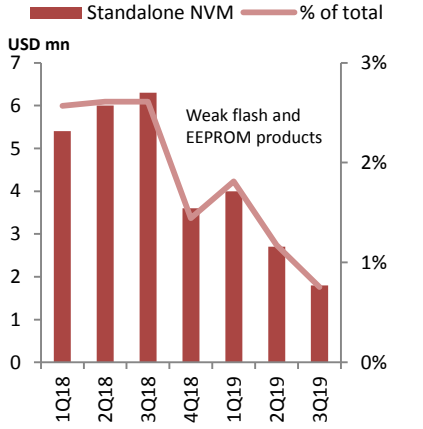


Figure 27. Standalone sales by quarter



Source: Company, Orient Securities (Hong Kong)

e-NVM to recover from softness helped by intelligent systems

Huahong's eNVM product line serves a broad range of applications including smart card, MCU and SoC, consists of eFlash solution with high density and fast program/erase time, eEEPROM solution with excellent endurance, logic-compatible and cost-effective eOTP/eMTP solutions. Performance in FY18 was robust as its cost-effective 90nm embedded memory technology drove shipments of bank-card ICs to a record high, doubling YoY. But, 1H19 was a soft market for the foundry industry due to inventory stuffing and falling memory prices across the board. In particular, demand for bank cards were weak and eNVM revenue in 1H19 fell 4.6% YoY to US$164.3mn, accounting for 36.4% of total revenue, down from 39.2% in 1H18.

3Q e-NVM saw stronger performance in MCUs and weaker smart cards/flash

eNVM revenue fell 1.5% YoY in 3Q19 mainly due to weak demand for smart cards/flash which carried forward from 1H19 but MCUs were a bright spot helped by increased demand in China/Asia. Going forward, HH intends to move some smart card production to Wuxi 300mm and expand MCU lines.

90nm embedded flash to provide the next growth engine

Responding to the market demand of MCUs required for future intelligent control applications, HH optimized and expanded its eNVM technologies, notably in the 90nm node. As the product mix improved, HH's embedded flash MCU ASP and shipment increased YoY. Further, we note an increase in the number of new products utilizing 0.11µm embedded flash technology.

Figure 26. eFlash technological milestones

Source: Company, Orient Securities (Hong Kong)

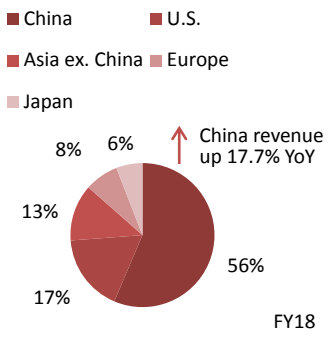
Shrinking standalone NVM segment

1H19 standalone NVM revenue accounted only for 1.5% of total revenue down from 2.6% in FY18. 3Q19 revenue of US$1.8mn saw a further decline of 71.4% YoY to just 0.8% of total revenue. This was due to the decreased demand for flash and EEPROM products. There was also decreased demand for flash products from U.S. in 3Q19.

Global, diverse base of customers

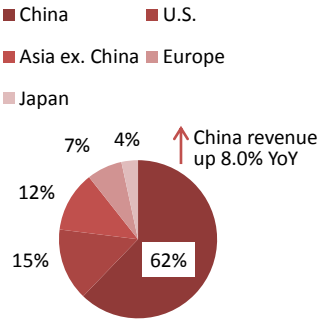
Huahong serves about 600 customers across 20 countries worldwide, with the top 5 customers contributing to less than 30% of revenue. We believe its top 3 customers are smart cards/power discrete vendors in China, contributing to ~15% of total revenue, while its top 15 customers, located all across the world, contribute to half of total revenue.

Figure 28. Revenue breakdown by region



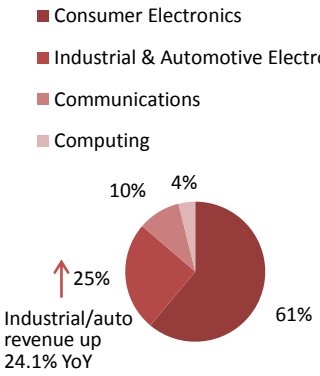
Source: Company, Orient Securities (Hong Kong)

Figure 29. 3Q19 geographic contribution



Source: Company, Orient Securities (Hong Kong)

Figure 32. 3Q19 end-market contribution



Source: Company, Orient Securities (Hong Kong)

Figure 33. FY18 PBT sensitivity to FX

USD/RMB	USD +5%	USD -5%
PBT	-$26.8mn	+$26.8mn
Change	-12.1%	+12.1%

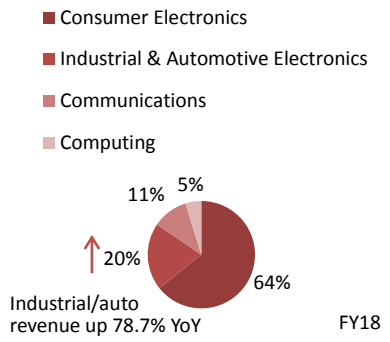
Transactional currency exposures arise from sales or purchases by its significant subsidiary operating in PRC in USD other than RMB, its functional currency. ~43% of sales/~41% of COGS of the subsidiary were denominated in non-RMB, and the above table summarizes the sensitivity of the fluctuation of the RMB exchange rate.

Source: Company, Orient Securities (Hong Kong)

China is a key growth engine in 2020+ despite a soft 1H19

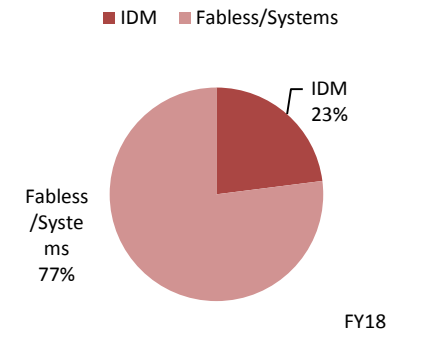
China is its largest market, contributing to 54%/56% of total revenue in 1H19/FY18. 1H19 saw a 3.2% YoY decline in China revenue which we believe was primarily due to a weaker industry, particularly in smart cards, bank cards and ID cards (~3% of total revenue). 3Q19 saw China revenue rebound 8.0% YoY. We believe China is in a secular bull market for ICs and will continue to gain world market share for both IC consumption (increasing end demand and applications) and foundry size (nearer to customers).

Figure 30. Revenue by end market



Source: Company, Orient Securities (Hong Kong)

Figure 31. Revenue split by customer type



Source: Company, Orient Securities (Hong Kong)

Industrial/automotive verticals provide a big boost to growth

Industrial/automotive end market revenue grew 6.1% YoY in 1H19 against a tough comparison of +78.7% YoY for FY18. Contribution to total revenue maintained at ~20% in 1H19/FY18. Its discrete technologies were well recognized (MOSFETs employed in automotive body stabilization systems/IGBTs utilized in inverters for electric vehicles) and were a reliable platform for automotive electronic power devices. It also developed new-generation technologies such as super-junction (SJ) MOSFET Generation III, RC-IGBT and SJ-IGBT, which will facilitate revenue growth 2019+.

5G smartphones, IoT a new emerging growth market

Due to a sluggish global smartphone market in 2H18, HH's smartphone related chip revenue in FY18 declined 5.5% YoY, but 1H19 saw a 24.4% YoY rebound for the segment, accounting for 12.9% of total revenue (FY18: 10.7%). This was mainly helped by improvement in 0.13μm RF-SOI in order to meet the global market demand for mobile RF Front End Modules, including the RF switch, the antenna tuner, the low noise amplifier and the integrated module, which has begun mass production in FY19E. Looking forward, the company intends to expand into new wireless related technologies, riding the 5G cellular standard upgrade and the growth of IoT devices.

Net profit 24.6% CAGR from 2013-18

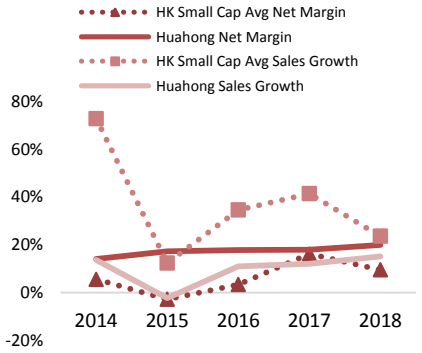
Huahong Semiconductor's net income has grown rapidly thanks to a fast growing topline (2013-18 CAGR of 9.7%) and robust and improving net margins which increased every year from 10.6% in FY13 to 20.0% in FY18. During CY14-CY18, the company posted net margins which were on average ~10.6ppt higher than the market weighted average of companies in the Hang Seng Composite SmallCap Index despite slower revenue growth rate.

Since we expect HH-Wuxi to margin dilutive from FY19E to FY20E as initial yields would be low until capacity ramps up and processes are optimized, we estimate net income to decrease 14% YoY with net margin to fall 3.0% in FY19E. We expect GPM dilution of about 4ppt from FY18 levels as depreciation charges from Wuxi begin to impact gross profit while initial yields and volume would be lower. But, we see Huahong being able to execute their 300mm wafer strategy well, given that it has had a strategic investment in Huali which operates a 300mm foundry.

We sense that the management is confident in the future market demand for its ICs, particularly for power discrete, MCUs, power management/analog and RF. We also believe that growth would be robust in IoT, electric vehicles, 5G related markets. Thus, we estimate that GPM could begin to normalize in FY20E, especially in 2H20E as comparisons become easier on GPM. We expect FY20E net income to reach US$185.4mn, up 16% YoY, and GPM/net margin to be 30.4%/17.2% in FY20E.

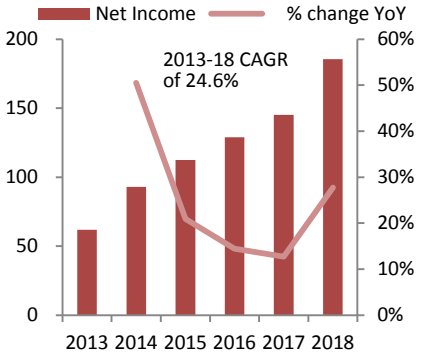
HH's net income growth is offered more upside from discrete growth as we estimate it carries ~40% GPM vs ~20-25% GPM for eNVM products.

Figure 34. HH v. "HSSI" small/mid cap profit growth



Source: Bloomberg, Orient Securities (Hong Kong)

Figure 35. Net income growth



Source: Bloomberg, Orient Securities (Hong Kong)

Figure 36. Net income sensitivity to eNVM/Discrete growth

Growth Sensitivity Analysis (Net Income)

Discrete Power Growth \ eNVM Growth	185.4	0%	5%	10%	15%	20%	25%	30%	35%
0%		162.3	163.7	165.0	166.4	167.7	169.1	170.5	171.8
5%		166.2	167.6	168.9	170.3	171.6	173.0	174.4	175.7
10%		170.1	171.5	172.8	174.2	175.5	176.9	178.3	179.6
15%		174.0	175.4	176.7	178.1	179.5	180.8	182.2	183.5
20%		177.9	179.3	180.6	182.0	183.4	184.7	186.1	187.4
25%		181.8	183.2	184.5	185.9	187.3	188.6	190.0	191.3
30%		185.7	187.1	188.4	189.8	191.2	192.5	193.9	195.2
35%		189.6	191.0	192.3	193.7	195.1	196.4	197.8	199.1

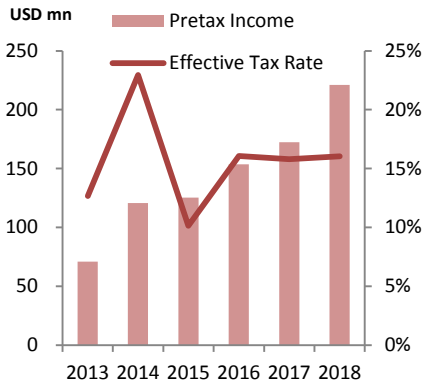
Source: Company, Orient Securities (Hong Kong)

Figure 37: Historical financials

USD mn	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	1H2019	YoY
Revenue	**585**	**665**	**650**	**721**	**808**	**930**	**451**	**2.5%**
Gross profit	125	198	201	220	267	311	142	-1.5%
GPM (%)	21.5%	29.8%	31.0%	30.5%	33.1%	33.4%	31.6%	-1.3ppt
Operating profit	64	123	121	142	171	221	105	10.1%
Net profit	**62**	**93**	**113**	**129**	**145**	**186**	**97**	**12.1%**
Net profit margin (%)	10.6%	14.0%	17.3%	17.9%	18.0%	20.0%	21.4%	1.8ppt
EPS (USD)	**0.07**	**0.11**	**0.11**	**0.12**	**0.14**	**0.17**	**0.07**	**-14.4%**
DPS (USD)	**-**	**-**	**0.03**	**0.04**	**0.04**	**0.04**	**-**	**-**

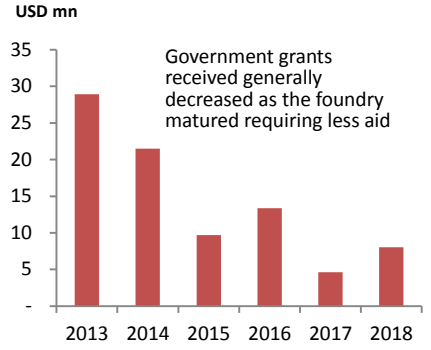
Source: Bloomberg, Company, Orient Securities (Hong Kong)

Figure 38: Effective tax rate



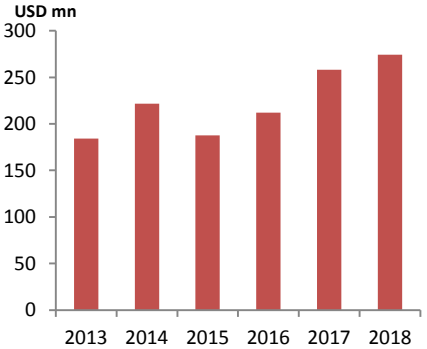
Source: Company, Orient Securities (Hong Kong)

Figure 39: Government grants received



Source: Company, Orient Securities (Hong Kong)

Figure 40: Net Operating Cash Flow



Source: Company, Orient Securities (Hong Kong)

Government funding and tax holiday to support Wuxi

As HHGrace is qualified as an enterprise producing integrated circuits of 0.25 μm below in width and thus is entitled to a preferential tax rate of 15% from 2017 to 2020. The statutory tax rate is 25% for corporate income in the PRC where Huahong generates the majority of taxable income (~76% of tax expense). Other regions account for ~1% of tax expense. Huahong also pays 10% withholding tax on dividend distribution from a subsidiary, accounting for ~12% of tax expense.

Tax holiday for Wuxi for 5 years

HH-Wuxi, a subsidiary, is allowed to be exempt corporate income tax for 5 years (ending around 2023) and subject to a deduction of 50% on the CIT rate for 5 years following the year HH-Wuxi starts to have taxable profit. HH-Wuxi will still enjoy the full 5-year tax holiday even if it does become profitable in less than 5 years. We believe the effective tax rate for the group can be maintained at ~16% for FY19E/FY20E.

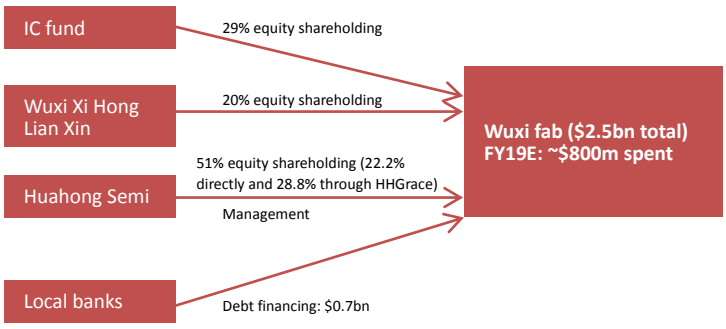
Government funding at ~$10mn annually but sporadic

The management believes they could receive ~$10mn funding from the government per year but this will be dependent whether certain R&D milestones can be reached and where certain capital expenditures or R&D expenses can meet the criteria qualifying for such grants. We believe it would be difficult for foundries to find enough financial support as building a 300mm wafer foundry take US$4bn-5bn or more to construct. Thus, we believe HH would continue to receive such grants, especially given the shareholding structure. Government grants are recognized in the income statement as other income to offset R&D expenses or depreciation charges if an asset is related.

Funding structure allows lower risk from Wuxi investment

Given the capital intensity of the HH-Wuxi investment, which will incur US$2.5bn in total for phase one, HH is supported by both the national IC fund and Wuxi Xi Hong Lian Xin, which together holds 49% of HH-Wuxi's equity. There is loan financing from local banks of ~ US$0.7bn and ~US$800m have been spent in FY19E. In FY20E, we expect further spending of ~US$1bn for HH-Wuxi and ~US$150mn for the Fabs 1-3. We expect HH to fund Wuxi project (for its portion) by using operating cash flow and cash including proceeds from disposals of financial instruments.

Figure 41: Wuxi fab shareholding and funding structure

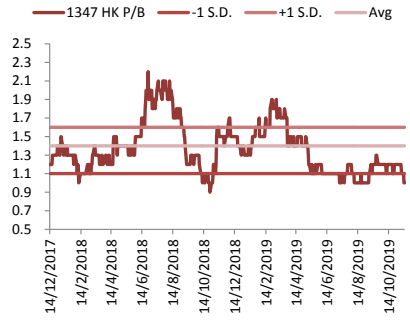


Source: Company, Orient Securities (Hong Kong)

Figure 42: Historical P/E

Source: Bloomberg

Figure 43: Historical P/B



Source: Bloomberg

Figure 46: Assumptions of DCF

WACC	13.4%
PV of FCF (2019F-22F)	3,037
Terminal perpetual growth rate	1%
FCF value per share	2.3
Terminal value per share	11.0
Net cash per share	4.9
DCF per share (HK$)	**18.2**

Source: Company data, Orient Securities (Hong Kong)

Figure 47: Historical EV/EBITDA

Source: Bloomberg

Initiate at BUY with TP of HK$19.0

Huahong Semi is well positioned as a specialty foundry, particularly in the power discrete space. Its advanced, differentiated technologies allow it to serve and meet customer's demand globally. Moreover, its track record in volume manufacturing of automotive ICs would fare well as the EV market is increasingly larger while demand for onboard infotainment grows. Further, IGBT/trench MOSFET are seeing increased use in many industrial applications. The 5G upgrade cycle should provide the catalyst for broad adoption of IoT/cellular devices, boosting demand for MCUs/RF.

As the Wuxi Fab begins risk production in 4Q19E, we are optimistic regarding the new capacity and technology phase one contributes. Thus, we expect total revenue to grow 1.2%/14.7% YoY to USD941mn/USD1,080mn in FY19E/FY20E and GPM to reduce 4.2ppt to 29.2% in FY19E and increase 1.2ppt to 30.4% in FY20E as firstly depreciation charges and lower initial yield hit but later stabilize. But, we sense that the management is confidence in executing the next growth phase and that the market demand will be uplifted as newer technologies enter mainstream. We derive our TP of HK$19.0 from equally weighting our DCF model TP of HK$18.2 and P/B valuation of HK$19.9 by using 1.34x FY20E book value (historical mean: 1.34x).

Figure 44: Huahong Semi's P/B valuation

FY20E BV (USD mn)	Minority interest (USD mn)	FY20E BVPS (USD)	Implied share price in HKD (1.34x P/B)
3,024	549	1.91	19.9

Source: Company data, Bloomberg, Orient Securities (Hong Kong)

Figure 45: Huahong Semi's DCF valuation

USD mn	2018	2019F	2020F	2021F	2022F
Pre-tax income	221	190	221	266	335
Tax paid	(27)	(23)	(26)	(32)	(40)
Depre. & Amort.	119	109	130	151	157
Change in WC	(15)	24	11	10	10
CAPEX	(230)	(278)	(328)	(218)	(128)
Free cash flow	**68**	**22**	**8**	**177**	**334**
Free cash flow (HK$ mn)	**533**	**173**	**59**	**1,382**	**2,606**

Source: Company, Orient Securities (Hong Kong)

Figure 48: Valuation Comparison

Name	Ticker	Last price (LCY)	Market Cap (HK$bn)	P/E 20E	P/B 20E	EV/EBITDA 20E	Div. yield 20E
Huahong Semi	**1347 HK**	**13.16**	**16.9**	**11.9**	**0.7**	**4.8**	**2.4**
Unrated							
SMIC	981 HK	10.60	53.6	55.9	1.1	11.4	-
TSMC	2330 TT	307.00	2,042.2	19.0	5.0	9.5	3.4
United Microelectronics	2303 TT	14.30	44.5	17.9	0.8	3.3	4.7
Vanguard	5347 TT	66.60	28.0	18.1	3.8	9.9	4.8
Average	-	-	-	**18.1**	**1.1**	**9.5**	**3.5**

Source: Bloomberg, Orient Securities (Hong Kong)

Financial statements & forecasts

Income Statement (consolidated)

FY-end Dec (US$mn)	2017	2018	2019E	2020E	2021E
Revenue	**808**	**930**	**941**	**1,080**	**1,258**
eNVM	312	361	351	396	455
Power discrete	221	310	335	419	528
Other	275	258	256	264	275
Cost of goods sold	**(541)**	**(619)**	**(666)**	**(752)**	**(852)**
Gross profit	**267**	**311**	**275**	**328**	**406**
Other income and gains, net	**18**	**34**	**38**	**43**	**50**
Selling and distribution expenses	(7)	(8)	(8)	(9)	(10)
R&D expenses	(50)	(45)	(56)	(76)	(101)
Administrative expenses	(59)	(78)	(75)	(86)	(101)
Operating Profit	**171**	**221**	**173**	**201**	**245**
Finance income/(cost)	5	7	12	15	16
Profit before tax	**172**	**221**	**190**	**221**	**266**
Income tax expenses	(27)	(35)	(30)	(35)	(43)
Minority interest	-	(2)	(2)	(2)	(2)
Discontinued operations	-	-	-	-	-
Net profit	**145**	**183**	**157**	**183**	**221**
EBITDA	**275**	**341**	**282**	**331**	**396**
EBIT	**171**	**221**	**173**	**201**	**245**
Basic EPS (USD)	**0.14**	**0.17**	**0.12**	**0.14**	**0.17**
DPS (USD)	**0.04**	**0.04**	**0.04**	**0.04**	**0.04**

Cash Flow (consolidated)

FY-end Dec (US$mn)	2017	2018	2019E	2020E	2021E
Pre-tax profit	172	221	190	221	266
Taxes paid	(20)	(27)	(23)	(26)	(32)
Depreciation of property, plant and equipment	101	116	106	127	147
Amortization of intangible assets	3	3	3	3	4
Change in working capital	10	(15)	24	11	10
Others	(8)	(24)	(60)	(64)	(66)
Operating cash flow	**258**	**274**	**240**	**272**	**329**
CAPEX	(138)	(230)	(278)	(328)	(218)
Disposals	0	0	0	0	0
Others	(59)	(487)	40	43	44
Investing cash flow	**(197)**	**(717)**	**(238)**	**(285)**	**(174)**
Change in debt	(2)	(61)	(4)	(4)	(4)
Dividends paid	(40)	(41)	(41)	(41)	(41)
Share issued	3	404	-	-	-
Interest paid	(2)	(2)	(0)	(0)	(0)
Other	(0)	565	0	0	0
Financing cash flow	**(41)**	**865**	**(46)**	**(46)**	**(46)**
Free cash flow	**128**	**68**	**22**	**8**	**177**
Net cash flow	20	422	(44)	(59)	110

Semi-Annual Breakdown

FY-end Dec (US$mn)	2H17	1H18	2H18	1H19	2H19E
Revenue	**427**	**440**	**490**	**451**	**491**
Gross profit	147	145	167	142	133
Operating profit	91	100	119	96	78
Pre-tax profit	98	99	122	105	85
Tax	(21)	(13)	(22)	(9)	(22)
Net profit	**77**	**86**	**97**	**91**	**67**
Gross margin (%)	34	33	34	32	27
Operating margin (%)	21	23	24	21	16
Effective tax rate (%)	21	13	18	8	25
Net margin (%)	18	20	20	20	14
EPS (USD)	0.07	0.08	0.09	0.07	0.05
DPS (USD)	0.04	-	0.04	-	0.04

Source: Company data, Orient Securities (Hong Kong)

Balance Sheet (consolidated)

FY-end Dec (US$mn)	2017	2018	2019E	2020E	2021E
Current assets	**853**	**1,774**	**1,762**	**1,756**	**1,938**
Inventories	116	130	146	158	179
Trade receivables	112	177	179	205	239
Prepayments, deposits and other	10	12	13	14	17
Cash and cash equivalents	375	777	733	674	783
Other current assets	241	678	691	705	719
Non-current assets	**1,225**	**1,304**	**1,486**	**1,698**	**1,780**
Property, plant and equipment	733	773	940	1,136	1,202
Intangible assets	7	10	12	13	15
Other non-current assets	484	521	535	548	563
Total assets	**2,078**	**3,078**	**3,248**	**3,454**	**3,717**
Current liabilities	**337**	**330**	**372**	**423**	**491**
Trade payables, other payables	68	79	92	100	113
Other current liabilities	181	216	249	288	336
Interest-bearing bank borrowings	61	4	4	4	4
Tax payable	27	30	27	31	37
Non-current liabilities	**46**	**44**	**40**	**36**	**31**
Deferred tax liability	14	18	18	18	18
Long-term debt	32	26	22	17	13
Total liabilities	**383**	**374**	**412**	**459**	**522**
Share Capital	1,555	1,960	1,960	1,960	1,960
Share premium and reserves	140	744	871	1,065	1,298
Total equity	**1,695**	**2,704**	**2,853**	**3,024**	**3,249**
Total liabilities & equity	**2,078**	**3,078**	**3,265**	**3,483**	**3,771**
Net cash/(debt)	282	746	707	652	766
Working capital	229	35	8	1	(3)
Total capital employed	1,741	2,749	2,876	3,031	3,227
Net gearing (%)	NC	NC	NC	NC	NC
BVPS (US cents)	**1.64**	**2.53**	**2.22**	**2.35**	**2.53**

Key Ratios

FY-end Dec	2017	2018	2019E	2020E	2021E
Growth (%)					
Revenue	12	15	1	15	17
Gross profit	21	16	(12)	19	24
EBITDA	21	24	(17)	17	20
EBIT	20	29	(22)	16	22
Net profit	13	28	(14)	16	21
Basic EPS	13	22	(28)	16	21
Margins (%)					
Gross	33	33	29	30	32
EBITDA	34	37	30	31	31
EBIT	21	24	18	19	20
Net	18	20	17	17	18
Others (%)					
Effective tax rate	16	16	16	16	16
Dividend payout ratio	27	22	26	22	18
RoCE	9	8	7	7	8
RoA	7	6	5	5	6

Key Assumptions

FY-end Dec (YoY %)	2017	2018	2019E	2020E	2021E
eNVM	18	16	(3)	13	15
Power discrete	12	41	8	25	26

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